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# (54) A roller diverter for use with a band conveyor

(57) A roller diverter for use with a multiple band or chain conveyor (2) comprises at least one powered roller (5) the axis of rotation of which extends in the direction of travel of the conveyor (2) and which, in use to divert an article from the conveyor (2), is inclined upwardly in the direction of travel of the conveyor (2) from a point beginning below the upper surface of the conveyor (2). A substantially horizontal roller (4) may be provided between the inclined power roller (5) and the inside edge of the diverter to help maintain the forward momentum of an article diverted from the conveyor (2) and a plurality of idler wheels (6) may be provided to help steer the article in its new direction of travel. Lift means is provided to raise and lower the rollers 4, 5 and the idler wheels between the bands or chains of the conveyor (2).

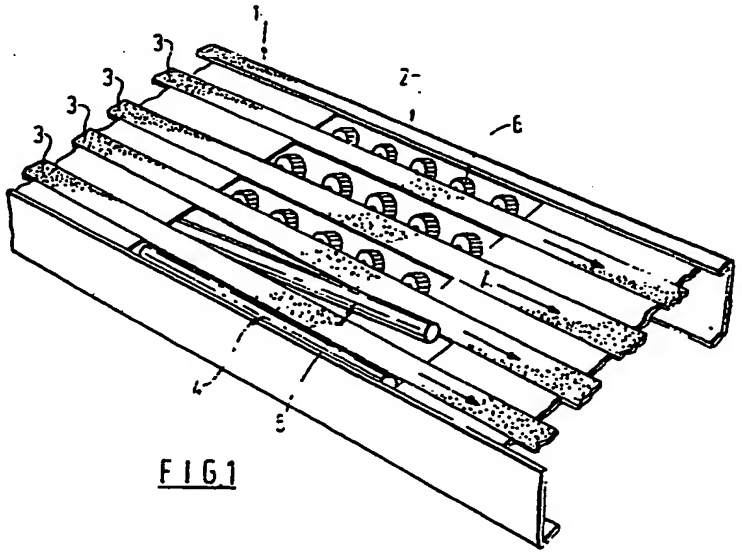


FIG1

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

GB 2 210 841 A

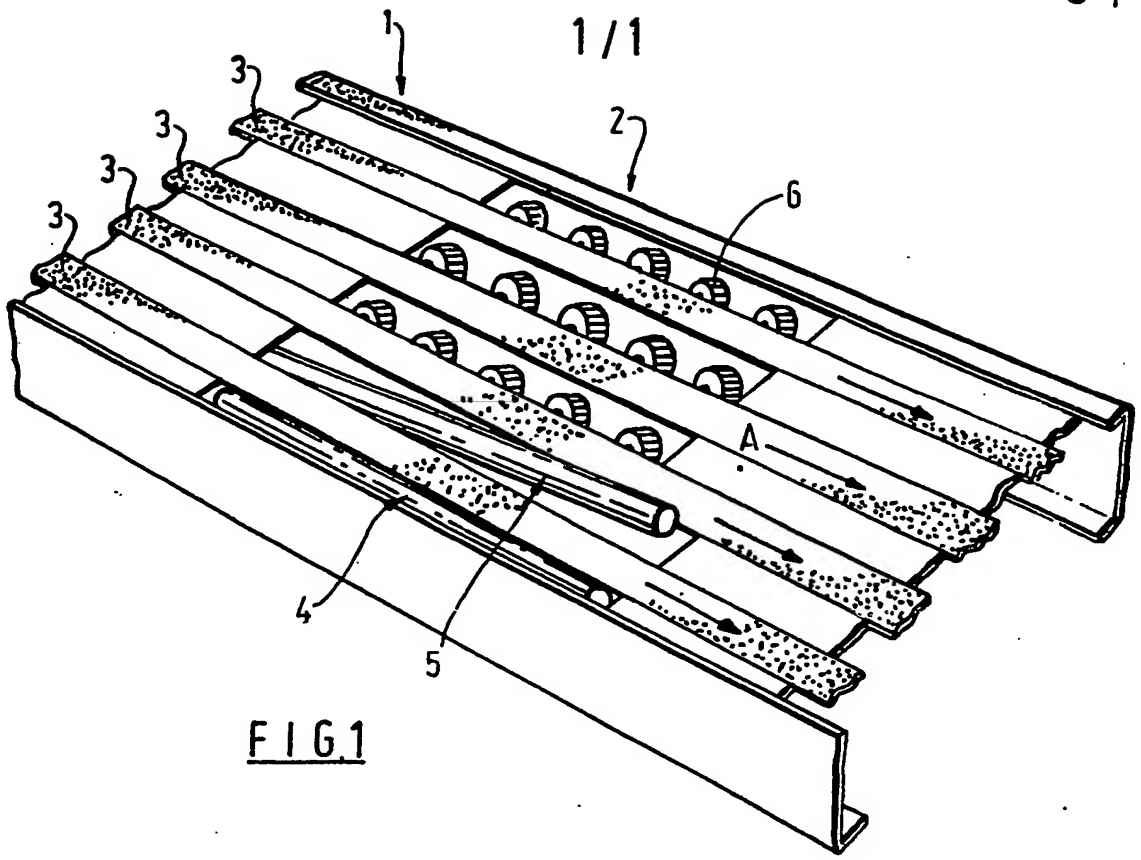


FIG.1

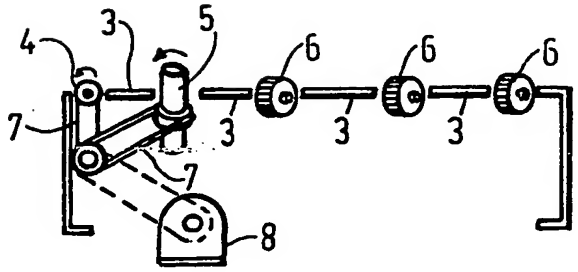


FIG.2

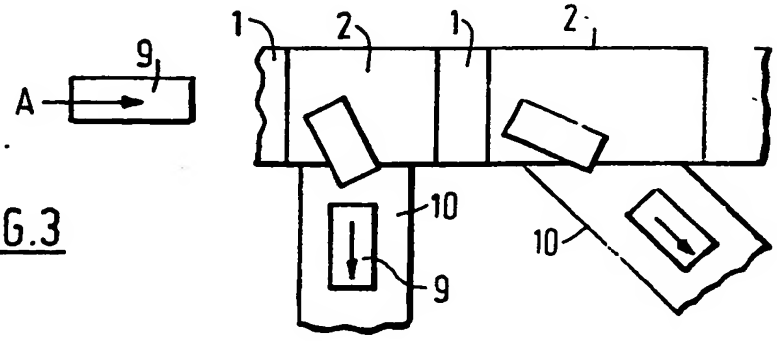


FIG.3

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# DESCRIPTION

## "A ROLLER DIVERTER"

The present invention relates to a powered roller diverter for use with a conveyor system. More particularly, the present invention relates to a powered roller diverter whereby articles conveyed on a multiple belt or chain conveyor can be diverted from the conveyor to another conveyor or to a storage position.

Conveyor systems which have the ability to divert articles from a conveyor, particularly where this occurs at a number of positions along the conveyor, are known as sortation or sorting systems. These sorting systems are widely used in, for example, the postal industry, where the addresses of parcels are read as they travel along a conveyor and each parcel is diverted from the general flow of articles along the conveyor to a collection point for parcels having a specific end destination. They are also used in the packaging industry where various different kinds of articles conveyed along a common conveyor system are sorted into common groups.

Generally speaking all sortation systems, whatever their specific application allow articles, parcels, packs and the like which are being conveyed in random order to be sorted into groups having some common aspect. This "common aspect" may be based on groups having a common end destination, as with posted parcels, size or weight, or the articles in each group may simply all be the same. Identification, if not done manually, is electronic in which case it may rely upon a variety of sensor means, including bar code readers, colour code readers, weighing devices, etc. The system may also track each article or group of articles along the conveyor once they have been identified. These sensors or readers and the way they work form part of the prior art and, therefore, a detailed understanding of their modus operandi is not given herein.

Sortation systems are generally designed around belt conveyors, powered roller conveyors, powered wheel conveyors and chain conveyors. Various types of diverter are known, each of which suffers from particular disadvantages and limitations which restrict their use to a particular conveyor system. These various types of diverter include the powered roller diverter, the wheel diverter, the belt diverter, the chain diverter and pushers. Of these the powered roller diverter, the wheel diverter and the pusher are commonly used with multiple belt and chain conveyors.

The powered roller diverter comprises one or more horizontally orientated powered rollers arranged between the belts or chains of the conveyor. Usually the powered rollers lie below the belts or chains, but when an article to be diverted from the conveyor passes over they are raised to fire the article off in the direction of rotation thereof. Apart from the obvious difficulties of raising the powered rollers at the exact moment that the article lies above them, this type of diverter does not redirect the article forward along its new path of travel with the same leading edge, in other words the articles orientation relative to its direction of travel is changed. This may cause problems if the address of the article has to be re-read at some later point. Furthermore, the conveyor speed must be limited or else it becomes impossible to predict accurately the precise direction in which it will fire off from the diverter. In other words at high conveyor speeds variations in the article characteristics cause skidding and give rise to irregular transfer characteristics. Finally, the powered rollers must be raised and lowered for each and every article to be diverted. This is necessary to allow each article to pass fully over the powered rollers and as will be readily understood it severely compromises the speed and efficiency of the diverter.

The wheel diverter comprises a plurality of angled wheels which are arranged between the belts or chains of the conveyor on a platform which can be raised or lowered to redirect an article or allow it to pass on along the conveyor. Because the wheel diverter is a passive, that is to say unpowered, system the conveyor must be run at high speed to ensure that the article has sufficient momentum to carry it through the diverter. Moreover, there is a limit to the minimum and maximum weight of articles which will successfully transfer across the diverter. Even powered wheel diverters are not entirely satisfactory in as much as whilst they obviated the problems of unpowered wheel diverters they will still not transfer satisfactorily articles with a soft or uneven base.

Finally, there are pushers. Essentially these comprise a mechanical arm which pushes an article to be diverted off the conveyor as it passes by. The article orientation relative to its direction of travel is inevitably changed and there is a risk of product damage occuring as the article contacts the arm.

It is an object of the present invention to provide a roller diverter which obviates or at least substantially mitigates the problems associated with prior art diverters referred to hereinabove.

According to the present invention there is provided a roller diverter for use with multiple band or chain conveyors comprising at least one powered roller the axis of rotation of which extends in the direction of travel of the conveyor and is inclined upwardly in the direction of travel of the conveyor from a point beginning below the upper surface of the conveyor.

In use, the powered roller is raised from beneath the belt to divert an article from the conveyor on which it is travelling forwards. As the article is driven forward on the conveyor it rides up the inclined powered roller and

its leading edge is steered sideways and away from the previous direction of travel. As will be appreciated, the inclined roller raises the leading edge of the article, but its trailing edge remains in contact with and is driven forward by the conveyor. Hence the article steers into and is turned away by the powered roller. In this respect, it can be compared to a car steering into a bend in the road where the camber of the road is inclined to turn the car towards the new road direction. In the diverter, as with the car, the new direction of travel of the article is determined by the angle of incline of the powered roller and the speed at which it rotates.

Preferably, the diverter comprises a substantially horizontal roller at or towards the inside edge of the diverter from the inclined powered roller which helps to maintain the forward movement of the article in its new direction of travel. The substantially horizontal roller may be powered, in which case it is conveniently driven from the same drive as the inclined powered roller. Alternatively, it may be a passive or "gravity" roller.

Preferably, the diverter further comprises a plurality of wheels located between the bands or chains of the conveyor towards the outside edge of the diverter which wheels are turned towards the intended direction of travel of the article from the diverter. These wheels facilitate movement of the article forward up the inclined powered roller and help to steer the trailing edge of the article around to follow the leading edge of the article which is being steered in a new direction by the inclined powered roller.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows a roller diverter embodying the present invention in use in a multiple band conveyor;

Fig. 2 shows a schematic cross-section through the roller diverter of Fig. 1 along lines I-I; and,

Fig. 3 shows a schematic plan view of a sortation system comprising two roller diverters embodying the present invention.

Referring to Figs. 1 and 2 of the accompanying drawings there is shown a roller diverter embodying the present invention, indicated generally by reference numeral 1, in use in a multiple belt conveyor, indicated generally by reference numeral 2. The multiple belt conveyor 2 comprises a plurality of belts 3 the direction of travel of which is indicated by arrows A. In this respect, operation of the multiple belt conveyor 2 is conventional and does not require detailed explanation herein.

The roller diverter 1 comprises two powered rollers 4 and 5, and a plurality of freely rotatable wheels 6 mounted on a support platform (not shown) which can be raised and lowered vertically relative to the belts 3. In this respect, when the support platform is lowered both rollers 4 and 5, and all the wheels 6 lie below the level of the belts 3 so as not to interfere with the passage of articles carried forward on the conveyor 2.

Both powered rollers 4 and 5 are driven through respective belts 7 from a common drive 8. Roller 4 which is positioned on the inside edge of the diverter 1 has a horizontally disposed axis of rotation - that is to say, its axis of rotation lies parallel with and extends in the direction of travel A of the belts 3. The axis of rotation of roller 5 is, however, inclined upwardly in the direction of travel A of the belts 3 such that when the support platform is raised it rises upwardly from below the belts 3. The axis of rotation of the wheels 6 are all turned at an angle to the direction of travel A of the belts 3 and they all point towards the inside edge of the diverter.

In use, that is to say when the diverter 1 is required to divert an article from the direction of travel A of the belts 3, the support platform is raised so that the powered rollers 4 and 5, and the wheels 6 rise up between the belts 3. As an article 9 is driven forward on the conveyor 1 (as shown schematically in Fig. 3) over the diverter 1 its leading edge rides up the inclined powered roller 5, powered up the incline by the bands 3 on which its trailing edge continues to rest. Simultaneously, the leading edge of the article 9 starts to turn in the direction of rotation of the inclined powered roller 5, away from the direction of travel of the belts A. As the leading edge of the article 9 swings round its trailing edge is carried round on the wheels 6 and by the time the article 9 is fully over the diverter 1 its leading edge is already moving forward off the diverter in the articles new direction of travel, indicated by arrow B. Finally, as the article 9 moves forward off the inclined powered roller 5 its trailing edge contacts the horizontal roller 4 which helps to drive it fully onto a separate conveyor 10 which conveys it away from the diverter.

As shown in Fig. 3 the angle of the new direction of travel B may form a right angle with the original direction of travel A or the change in direction may be less sharp. In actual fact, the new direction of travel of the article is determined by the angle of incline of the powered roller and the speed at which it rotates. This makes the diverter of the present invention particularly versatile.

It will be appreciated from the explanation given above of the diverters operation that the orientation of an article relative to its direction of travel is not changed as it is diverted. A further advantage of the diverter of the present invention is that it need not be lowered and raised as each new article to be diverted approaches it, as is the case with conventional powered roller diverters.

Because the rearward end of the inclined powered roller starts below the level of the conveyor, the article simply rides up it as it moves over the diverter. Obviously, this removes the necessity to synchronise raising the diverter with the arrival of the article into a position directly above it. In addition, the diverter of the present invention is capable of coping with a wide range of article weights and sizes and with articles with soft and/or uneven bases.

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CLAIMS

1. A roller diverter for use with a multiple strand belt or chain conveyor comprising at least one powered roller the axis of which extends in the direction of travel of the conveyor and which, when in use to divert an article from the conveyor, is inclined upwardly in the direction of travel of the conveyor from a point beginning below the upper surface of the conveyor.

2. A roller diverter according to claim 1, comprising lift means for raising and lowering the said at least one powered roller relative to the upper surface of the conveyor.

3. A roller diverter according to claim 1 or 2, comprising a substantially horizontal roller which lies alongside the said at least one powered roller and has an axis of rotation which extends in the direction of travel of the conveyor.

4. A roller diverter according to claim 3, wherein the substantially horizontal roller is rotatably driven from the same drive as the said at least one powered roller.

5. A roller diverter according to claim 3 or 4, comprising lift means for raising and lowering the said substantially horizontal roller relative to the upper surface of the conveyor.

6. A roller diverter according to any preceding claim, comprising a plurality of idler wheels adapted, in use, to be located between the belts or chains of the conveyor, which idler wheels are angled relative to the direction of travel of the conveyor towards the said at least one powered roller.

7. A roller diverter according to claim 6, comprising lift means for raising and lowering the idler wheels relative to the upper surface of the conveyor.

8. A roller diverter substantially as herein-before described with reference to the accompanying drawings.

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